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GB 1588979 GB 0700139
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(54) Sprinkler

(57) The present invention comprises a sprinkler comprising:
a port (34);
a rigid and breakable body (4) which whilst intact is capable of sealing the port (34) and which when broken would no longer seal the port (34);
a breaking means (5) which, when actuated, can break the rigid and breakable body (4); and
a temperature-dependent actuating means (6), (8) to (12) which, when it attains a predetermined elevated temperature, can actuate the breaking means (5):
the arrangement being such that, in use, when the predetermined elevated temperature is attained, the actuating means (6), (8) to (12), actuates the breaking means (5) which causes the body (4) to break, thereby unsealing the port (34). The body (4) may be a hollow glass drum (4) which is filled with metal filaments arranged loosely inside as the breaking means (5). The actuating means (6), (8) to (12), may comprise a spring plate (8) which releases an impact spring (11) at a predetermined temperature, which strikes a small metal tube (6) filled with an impact-sensitive mass causing ignition of the metal filaments (5) and bursting of the glass drum (4).

FIG. 1

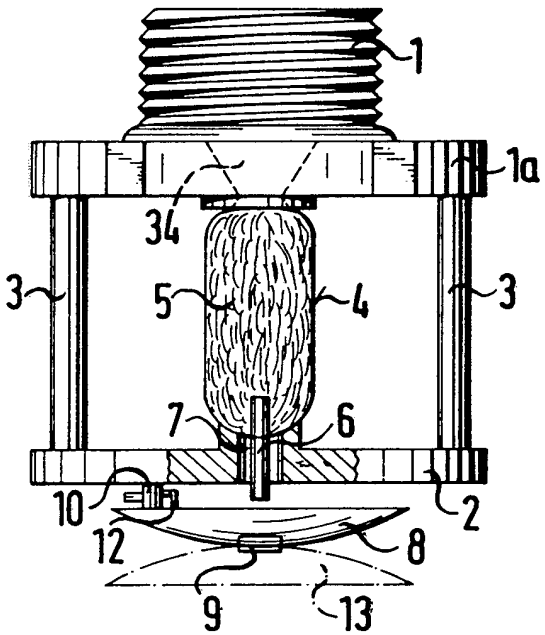

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FIG. 1

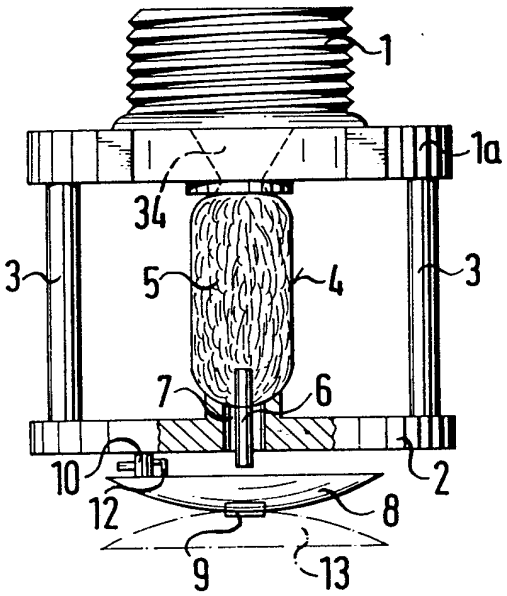
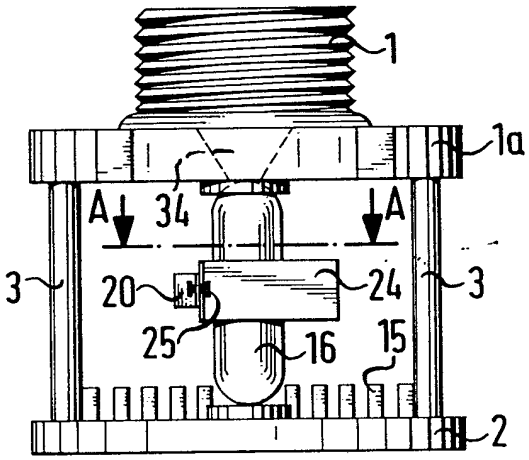


FIG. 2



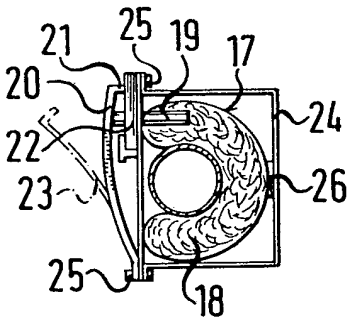


FIG. 2a

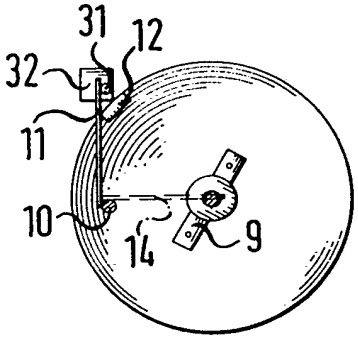


FIG. 1a

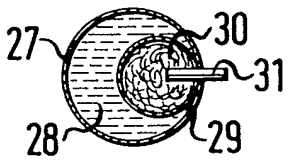


FIG. 3

SPECIFICATION

Sprinkler

This invention relates to a sprinkler, especially one designed for use with automatic fire extinguishing systems.

Known sprinklers have a sprinkler body having at one end a screw thread and at the other a projecting flange; they have provision for a temperature dependent release mechanism, developed as a filled glass body, one end of which seals a port opening in the sprinkler body.

Fire extinguishing systems with sprinklers of the type mentioned above are automatic fire protection systems in the sense that they can sense the presence of a fire and endeavour to hold it under control. The sprinkler system is not designed to replace existing fire extinguishers, but it creates the pre-requisites for fire fighting to be carried out successfully in difficult situations where other extinguishing means may be of little help.

The extinguishing means, water, is piped through the sprinkler arrangement by means of a permanent network of pipes to conveniently situated permanent nozzles, which are the sprinklers.

The sprinklers are always closed in the standby state of the arrangement and do not open until they are heated to their opening temperature. In the case of fire, therefore, only those sprinklers which are located in the region of the fire open.

The sprinklers of most sprinkler arrangements are sealed with a liquid-filled glass drum which when sufficiently heated causes the liquid to expand and thus causes the glass drum to shatter.

There are also sprinklers, which are sealed with a soldered link which, when heated, melts to open the port.

A considerable energy supply is required for release with both the soldered link as well as with the glass drum sprinkler. This energy is needed either to melt the solder or to boil the liquid contained in the closed glass drum of a glass drum sprinkler. A drawback is that not all of the available thermal energy is used in melting the solder or boiling the liquid, because part of the heat transferred to the sprinkler from the fire is conducted away through the pipes and their water filling.

The faster that a sprinkler opens, the sooner that any coupled alarm arrangement is set in action, so that the fire brigade can be at the fire more quickly.

Recently there have been endeavours to shorten the response time of sprinklers, in order thus to bring a source of fire under control more quickly; for it is known that, the earlier a fire outbreak is fought, the easier it is to extinguish. So that water gets to the fire as early as possible, the sprinkler must open very quickly. The sprinkler release time with given fire situations is determined through the temperature sensing element, as well as through the location of the sprinkler in relation to the fire.

In order to shorten the reponse of time known, glass drum sprinklers have been triggered through pyrotechnic elements. When these ignite the glass drum is destroyed and thus the sprinkler opened. Also additional contacts have been attached on or around the glass drum as disclosed in (DE-AS 23 36 882), in order to destroy the glass drum more quickly and thus to reduce the response time. Both with the pyro-technic elements, as well as with the additional contacts, an electric trigger from outside is required. Besides the fact that additional cost-intensive, electric installations and monitoring devices are thus required, such devices are not absolutely sure, because with a power cut an additional ignition is not applicable.

Furthermore, it is known to provide a sprinkler which relies on the melting of solder, with a refined system, e.g. soldered links, which respond more quickly. With such sprinklers, release values have been achieved that are five to six times better than those associated with the conventional glass drum sprinklers. These refined soldered links suffer, however, from the disadvantage that, mechanically, they are not particularly consistent and thus do not offer the necessary security.

According to the present invention, there is provided a sprinkler comprising:

a port;

a rigid and breakable body which whilst intact is capable of sealing the port and which when broken would no longer seal the port;

a breaking means which, when actuated, can break the rigid and breakable body; and

a temperature-dependent actuating means which, when it attains a predetermined elevated temperature, can actuate the breaking means:

the arrangement being such that, in use, when the predetermined elevated temperature is attained, the actuating means actuates the breaking means which causes the body to break, thereby unsealing the port.

The energy needed for actuation is not used, according to the present invention, until the moment of actuation, but it is present and stored as potential energy, and is released as soon as the temperature dependent actuating means responds to a rise in temperature and thus the stored energy effects the faster actuation of the sprinkler itself.

The present invention can thus provide a sprinkler which responds faster than the glass drum sprinklers and the sprinklers with refined soldered links and, what is more, normally provides a higher security.

Sprinklers according to the present invention have a response time according to DIN EN 54

part 5, page 3, table 1, which is always in response class 3 and, in many cases, class 2 or even class 1 can be achieved.

A fast-responding sprinkler does not just have the advantage that the spread of fire can be prevented, but, what is more, provides a system whereby the fire brigade may be alerted to the presence of a fire, and thus be able to tackle the fire, at an earlier stage than a slower responding systems would alert them. A further advantage of the fast sprinkler can be seen in that only a few sprinklers open, in the region of the fire (before the latter has spread), and thus water damage is substantially reduced.

Preferably the temperature-dependent actuating means comprises a releasable initiating means and a detonation means.

Preferably the releasable initiating means is a resilient member which is capable of being held in a stressed condition and of striking the detonation means.

Preferably the resilient member is held in the stressed condition by a spring plate.

Preferably the spring plate has a distortion.

Preferably the resilient member is held in the stressed condition by a bimetallic strip.

Preferably the resilient member is also held by a ram and interlocked by a magnet.

Preferably the detonation means is a metal tube filled with an impact sensitive mass, and one end of the metal tube is sealed and positioned such that, in use, the releasable initiating means, when released, strikes the sealed end of the metal tube.

Preferably the other end of the tube is unsealed and is introduced into the breaking means.

Preferably the rigid and breakable body is made of glass.

Preferably the rigid and breakable body is solid.

Preferably the rigid and breakable body is hollow.

Preferably the rigid and breakable body is filled with an inert liquid.

Preferably the rigid and breakable body contains the breaking means, which breaking means, when actuated, is capable of producing a pressure sufficient to break the rigid and breakable body.

Preferably the breaking means comprises metal filaments.

Preferably the metal filaments are magnesium, aluminium or zirconium filaments.

Preferably the breaking means also includes an oxidising means.

Preferably the breaking means comprises an explosive.

Preferably the explosive is nitropentaerythrol.

Preferably the explosive is present in the rigid and breakable body in a compact, gaseous or liquid form.

When a prestressed spring plate is employed as part of the releasable initiating means, it can spring free with the slightest heating into its unstressed position and thus free the resilient means, which is often an impact spring. The impact spring strikes the detonation means which contains an impact sensitive mass, and the impact-sensitive mass ignites. The resulting flame then penetrates, in some embodiments, into the inside of the rigid and breakable body and there ignites metal filaments which are present, whereby the rigid and breakable body explodes and thus unseals the port. Such a release means is ten times faster than a conventional glass drum filled with liquid. It is still five times faster than a sprinkler with a refined soldered link.

In order to give existing glass drum sprinklers a faster response time there is a preferred embodiment of the present invention in which the rigid and breakable body is in contact with part of the breaking means, the breaking means comprising a rupturable container which contains an actuatable element which, on actuation, creates a pressure sufficient to break both the rupturable container and the rigid and breakable body.

Preferably the rupturable container is arcuate and filled with metal filaments.

Preferably the rupturable container is arranged inside the rigid and breakable body.

Preferably the rupturable container is attached, by means of a fastening with a screw connection, to the rigid and breakable body.

When the releasable initiating means includes a bi-metallic strip, it can be deformed with the slightest heating, so that the impact spring is released as quickly as possible and thus the impactsensitive mass is ignited and the metal filaments explode. Not only the rupturable container holding the metal filaments, but simultaneously the breakable body (which can be like the glass drum of the conventional sprinkler arrangement) is destroyed, and as a result the port very quickly unsealed to extinguish the fire. Instead of the bi-metallic strip, a strip of metal with the power of recollection (memory) can also be employed.

Preferably the sprinkler is provided with a sprinkler body which has at one end a screw thread and at the other end a projecting flange and which carries at least one support for a transverse bearing bush.

The detonation means may be a conventional detonator known per se for known ignition devices. If the filling of the rigid and breakable body consists of an explosive, e.g. nitropentaerythrol or black powder then a quick and reliable destruction of the rigid and breakable body and thus quick activation of the extinguishing arrangement is guaranteed.

The rigid and breakable body can be formed from, instead of glass, ceramics, porcelain, aluminium, or some other synthetic material.

For a better understanding of the present invention and to show how the same may be

carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:

Fig. 1 is a side view of a sprinkler in accordance with one embodiment of the present invention;

Fig. 1a is a plan view of a sprinkler of Figure 1;

Fig. 2 is a side view of another embodiment of a sprinkler in accordance with the present invention;

Fig. 2a is a sectional view along the line A-A in Fig. 2; and

Fig. 3 is a section through part of another embodiment of a sprinkler according to the present invention.

The sprinklers according to Figs. 1 and 2 are portrayed in side view and comprise an upper screw thread 1, a flange 1a, and a transverse bridge 2 held in spaced relation to the flange 1a by two vertical supports 3. In the flange 1a is a port 34 sealed by a rigid and breakable body which, in the illustrated embodiments of Figs. 1 and 2, is in the form of a hollow glass drum 4 and 16, respectively. In Fig. 2 a toothed spray umbrella 15 is also shown. In Fig. 1, instead of a normal liquid filled glass drum, the drum 4 is filled with metal filaments 5 arranged loosely inside. At the lower end, of the drum 4, a small metal tube 6 filled with an impact-sensitive mass, is soldered in place; the tube 6 projects downwards through an opening 7 in the transverse bridge 2. A spring plate 8 is fastened below the transverse bridge 2 in Figure 1, the fastening is indicated schematically in Fig. 1a by reference numeral 9. This fastening 9 is linked to the transverse bridge 2, and the plate 8 is attached, either releasable or permanently, to the fastening 9. A pin 10, also fastened on the transverse bridge 2, is portrayed, on which a prestressed impact spring 11 is mounted. This is held in the stressed condition, by projection 12 of the plate 8. When the release temperature is reached, the spring plate 8 springs very quickly into the position 13 portrayed by dot-dashed lines and thus the projection 12 releases the impact spring 11, which then springs into position 14 also portrayed by dot-dashed lines (in Fig. 1a). Thus the small metal tube 6 is struck, and ignition of the metal filaments 5 follows, which causes bursting of the glass drum 4.

In Fig.2 another embodiment of the present invention is shown. In this example a conventional glass drum is designated by 16, i.e. in this respect it is a standard sprinkler of the glass drum type.

For faster release, an arcuate or horse-shoe shaped rupturable container 17 containing metal filaments 18 is fastened to glass drum 16. A small metal tube 19 filled with an impact-sensitive mass is soldered into the rupturable container 17. In order to effect release in this case a bi-metallic strip 20 with a flange 21 is provided. As is described in Figs. 1 and 1a in respect of spring 11, a spring 22 is prestreed. Upon heating, bi-metallic strip 20 moves quickly into the position 23 portrayed by dot-dashed lines. Thus the impact spring 22 is released and, through striking on the metal tube 19, the metal filaments are ignited and the energy given off to the contents of the glass drum 16 which is filled with a normal, low boiling liquid. As a result of this additional energy, this glass drum is destroyed more quickly. With this exemplary embodiment the fastening 24 for holding the container 17 in place is only portrayed in diagrammatic form with screw connections 25. An adaptor piece interposed between the rupturable container and the fastening 24 is designated by 26. So that the heat can be transferred more effectively to the drum 16, the hollow space present between the fastening 24 and glass drum 16 can be foam-insulated. This embodiment allows, in the simplest way, existing glass drum sprinklers to be modified.

Finally, Fig. 3 shows a section of another variant, which includes a glass drum 27 which is like a normal glass drum and is filled with a normal low boiling liquid 28. A further glass drum 29 containing metal filaments 30 is provided. Projecting into the drums 27 and 29 is a metal tube 31 filled with an impact-sensitive mass. The release device for this energy storage system is not portrayed, but can correspond to devices shown in Figs. 1 and 2.

In Fig. 1a an additional device is portrayed, consisting of a ram 31 with an indicated small magnet 32. The impact spring 11 is also stopped by this ram 31. Thus the impact spring 11 is held on the one hand by the projection 12 on the spring plate 8 and on the other hand by the ram 31. Not until both locking arrangements are moved aside can the spring 11 be freed and the small drum 4 be ignited. Thus one can have a doubly secured arrangement and one can also produce a change in the pre-controlled arrangements, in that the valve station is not pre-controlled through the fire signalling arrangement, but through individual sprinklers.

This pre-control can naturally be applied with a sprinkler according to Fig. 2.

CLAIMS

1. A sprinkler comprising:

a port;

a rigid and breakable body which whilst intact is capable of sealing the port and which when broken would no longer seal the port;

a breaking means which, when actuated, can break the rigid and breakable body; and

a temperature-dependent actuating means which, when it attains a predetermined elevated temperature, can actuate the breaking means:

the arrangement being such that, in use,

when the predetermined elevated temperature is attained, the actuating means actuates the breaking means which causes the body to break, thereby unsealing the port.

2. A sprinkler according to claim 1, wherein the temperature-dependent actuating means comprises a releasable initiating means and a detonation means.

3. A sprinkle according to claim 2, wherein the releasable initiating means is a resilient member which is capable of being held in a stressed condition and of striking the detonation means.

4. A sprinkler according to claim 3, wherein the resilient member is held in the stressed condition by a spring plate.

5. A sprinkler according to claim 4, wherein the spring plate has a distortion.

6. A sprinkler according to claim 3, wherein the resilient member is held in the stressed condition by a bimetallic strip.

7. A sprinkler according to any one of claims 3 to 6, wherein the resilient member is also held by a ram and interlocked by a magnet.

8. A sprinkler according to any one of claims 2 to 7, wherein the detonation means is a metal tube filled with an impact sensitive mass, and one end of the metal tube is sealed and positioned such that, in use, the releasable initiating means, when released, strikes the sealed end of the metal tube.

9. A sprinkler according to claim 8, wherein the other end of the tube is unsealed and is introduced into the breaking means.

10. A sprinkler according to any preceding claim, wherein the rigid and breakable body is made of glass.

11. A sprinkler according to any preceding claim, wherein the rigid and breakable body is solid.

12. A sprinkler according to any one of claims 1 to 10, wherein the rigid and breakable body is hollow.

13. A sprinkler according to claim 12, wherein the rigid and breakable body is filled with an inert liquid.

14. A sprinkler according to claim 12, wherein the rigid and breakable body contains the breaking means, which breaking means, when actuated, is capable of producing a pressure sufficient to break the rigid and breakable body.

15. A sprinkler according to claim 14, wherein the breaking means comprises metal filaments.

16. A sprinkler according to claim 15, wherein the metal filaments are magnesium, aluminium or zirconium filaments.

17. A sprinkler according to claim 15 or 16, wherein the breaking means also includes an oxidising means.

18. A sprinkler according to claim 14, wherein the breaking means comprises an explosive.

19. A sprinkler according to claim 18, wherein the explosive is nitropentaerythrol.

20. A sprinkler according to either claim 18 or 19, wherein the explosive is present in the rigid and breakable body in a compact, gaseous or liquid form.

21. A sprinkler according to any one of claims 10 to 13, wherein the rigid and breakable body is in contact with part of the breaking means, the breaking means comprising a rupturable container which contains an actuatable element which, on actuation, creates a pressure sufficient to break both the rupturable container and the rigid and breakable body.

22. A sprinkler according to claim 21, wherein the rupturable container is arcuate and filled with metal filaments.

23. A sprinkler according to claim 21, wherein the rupturable container is arranged inside the rigid and breakable body.

24. A sprinkler according to claim 22, wherein the rupturable container is attached, by means of a fastening with a screw connection, to the rigid and breakable body.

25. A sprinkler according to any preceding claim, being provided with a sprinkler body which has at one end a screw thread and at the other end a projecting flange and which carries at least one support for a transverse bearing bush.

26. A sprinkler substantially as described hereinbefore with reference to, and as shown in, Figures 1 and 1a of the accompanying drawings.

27. A sprinkler substantially as described hereinbefore with reference to, and as shown in, Figures 2 and 2A of the accompanying drawings.

28. A sprinkler substantially as described hereinbefore with reference to, and as shown in, Figure 3, of the accompanying drawings.

29. A fire extinguishing system which includes a water-conveying duct communicating with one or more sprinkler according to any preceding claim.

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